with certainty be decided to-day. The fact however, that the two sets of results, apart from the slight difference mentioned, are in their chief features so extraordinarily similar, is a new proof of the surpassing and decisive importance of the foregoing weather conditions "Witterungsvorgeschichte."

If we survey once again all these investigation results, then we must answer the question set forth at the beginning of this article as follows. That evidently, for variations in atmospheric circulation and for the whole formation of the weather, *the preceding condition of terrestrial weather is of more decisive importance than cosmic influences.* With this realization, a firm foundation has been secured to enable us to approach the *exploration of the problem of long-range forecasting.* In consideration of the problem of periodicity in the course of the weather, this realization means that possible periodic variations in solar radiation have a greater influence on terrestrial weather conditions only when they find a resonance in the complex system of the general circulation of the air, capable as it is of manifold oscillations in itself (8).

LITERATURE CITED

(1) F. BAUR. Statistische Untersuchungen über Auswirkungen und Bedingungen der grossen Störungen der allgemeinen atmosphärischen Zirkulation. III. Mitteilung. Annalen der Hydrographie und maritimen Meteorologie. 1926, pp. 227–236.

F. M. EXNER. Dynamische Meteorologie. 2. Auflage. Wien. 1925. p. 217.

(2) F. BAUR. Statistische Untersuchungen über Auswirkungen und Bedingungen der grossen Störungen der allgemeinen atmosphärischen Zirkulation. II. Mitteilung. Annalen der hydrographie und maritimen Meteorologie. 1925. pp. 243–258.

(3) O. v. AUFSESS. Kosmische Einflüsse auf die Luftdruckverteilung über Europa. II. Teil. Deutsches meteorologisches Jahrbuch für Bayern. 1925. Anhang H.

(4) F. BAUR. Statistische Untersuchungen über Auswirkungen und Bedingungen der grossen Störungen der allgemeinen atmosphärischen Zirkulation. V. Mitteilung. Annalen der Hydrographie und maritimen Meteorologie. 1927. pp. 367–372.

(5) F. BAUR. Statistische Untersuchungen über Auswirkungen und Bedingungen der grossen Störungen der allgemeinen atmosphärischen Zirkulation. IV. Mitteilung. Annalen der Hydrographie und maritimen Meteorologie. 1926. pp. 304–311.

(6) Zusammenhänge des Witterungscharakters des März in Deutschland mit der gleichzeitigen and der vorausgegangenen Luftdruckverteilung. Gerlands Beiträge zur Geophysik. XVIII. Bd. pp. 225–246, 361–378.

(7) F. BAUR. The 11-year period of temperature in the Northern Hemisphere in relation to the 11-year sunspot cycle. Monthly Weather Review. 1925. pp. 204–207.

(8) F. BAUR. Mehrjährige rhythmische Schwankungen der atmosphärischen Zirkulation als Eigenschwingungen angeregt durch die Sonne. Az Tdöjares. 1927. pp. 169–170 (Hungarian), pp. 190–191 (German abstract).

TABLE 1.—*Correlation coefficients (multiplied with 100) between the monthly means of pressure difference, Ponta Delgada, Iceland, and the sun-spot numbers*

(Period 1874/1923)

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
a. With the *simultaneous* monthly means of sunspot numbers	−16	+14	+1	±0	−40	+1	−3	−3	+18	+9	+14	−6
b. With the *increase* of the sunspot numbers from the *past* month	+5	−9	−20	+5	**−29**	−6	+8	−3	−14	+6	+10	+3
c. With the *increase* of the sunspot numbers up to the *next* month	+3	−8	−4	−8	+9	−16	**−36**	+11	−16	+17	−9	+0

The big coefficients are greater than twice the standard error.

TABLE 2.—*Correlation coefficients (multiplied with 100) of the simultaneous monthly means of pressure at stations of the subtropical belt of high pressure of the Southern Hemisphere*

(Period 1875/1924)

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
a. Argentina (2 stations) and Mauritius	+7	+21	−14	−1	−1	+14	**−33**	−25	+12	−14	+11	+14
b. Mauritius and Sydney (Australia)	+21	+5	**+28**	+18	+1	−2	+14	+10	**+33**	−5	+7	−2
c. Sydney (Australia) and Argentina (2 stations)	+8	+21	−19	**−32**	−20	−17	**−32**	−10	−17	−16	−9	+19

The big coefficients are greater than twice the standard error.

HIGH INTENSITY OF SOLAR RADIATION IN THE SPRING OF 1928

By P. GOTZ

[Die Naturwissenschaften, Heft 23, June 8, 1928, p. 474]

From experience it is known that in every year spring brings the highest value of total heat intensity of the sun. It is true that at that time the sun's rays have a path through the air strata longer than that traversed in summer, that on an average the ozone stratum is thicker,[1] and that in the first half of the year the atmosphere contains more floating particles (*Luftplankta*),[1] but at the same time it is in very large degree winter-dry. Measurements to date at Arosa (1,860 meters) show the maximum radiation in the year 1923, when the value reached was 1.6 calories per minute per square centimeter.

The spring of the present year brings especially high values. By reason of a rather large number of measurements not only with the Michelson actinometer, but also directly with the Abbot silver disk, the values under J' in the following table are trustworthy to within one-half of one per cent. In addition the table contains the time of observation, the corresponding elevation of the sun (h), the vapor pressure (e) and the relative humidity (*r. F.*).

Under J are entered the values of solar radiation theoretically possible when the atmosphere is entirely free from water vapor and dust and only the air molecules can cause depletion, that is, for a turbidity factor having

[1] Gotz, P. *Das Strahlungsklima von Arosa.* Berlin. 1926.

the value $T = 1.00$ (according to Linke); here 1.932 calories per minute per square centimeter is taken as the solar constant and also for the purpose of calculating the turbidity factor T.

Solar radiation, Arosa, Switzerland

Date	Hour	Elevation of sun (h)	Vapor pressure, mm. (e)	Relative humidity, per cent ($r. F.$)	Radiation intensity, cal. min. cm². Value observed (J')	Radiation intensity, cal. min. cm². Value for T=1.00 (J)	Turbidity factor (T)
1928		°					
Feb. 21	11:01 a. m.	30.8	(1.6)	31	1.59	1.64	1.17
Feb. 21	11:52 a. m.	32.2	------	------	1.59	1.65	1.21
Mar. 17	12:04 p. m.	41.9	(1.4)	30	1.61	1.68	1.28
Mar. 18	11:44 a. m.	42.1	1.4	24	1.63	1.68	1.20
Mar. 19	12:03 p. m.	42.6	2.0	32	1.59	1.68	1.37

Until now the value of 1.63 calories was vouched for only at elevations above 3,000 meters. The turbidity of the air, especially in so far as relates to the dates given above, was very moderate; the normal March values of T are as follows: Arosa, 1.5; Davos, 1.8; Potsdam, 2.2; and Frankfort on the Main, 3.5. At 1.4 mm. the determinative water vapor content was very low; in good agreement with this was the value $e = 1.5$ mm. at Arosa at the minimum of the turbidity factor, $T = 1.13$, on the midwinter date of January 15, 1925. Even in case the values $J - J'$ for the forenoon of March 18, 1928, are extrapolated to vacuous space there results no necessity of a cause for the high radiation values outside of the high transmissiveness of the atmosphere.

Does a higher value of the solar constant play a rôle in the marked solar activity? Whatever may be the case, it will be interesting to await values for the spring of this year obtained at other points and especially Abbot's values for the solar constant.[2]—*Translated by W. W. Reed.*

GROWTH OF TREES IN THE FOREST OF DEAN IN RELATION TO RAINFALL

[Reprinted from Meteorological Magazine, March, 1928]

Mr. E. G. Burtt has kindly supplied several series of measurements of the annual rings of growth of trees in the Forest of Dean. The best and longest series was given by a yew, which grew on a southwest slope overlooking Lower Sondley. The tree was cut in the winter of 1922–23, and proved to be 200 years old. The individual measurements are given in Table 1, and smoothed values constructed by taking overlapping five yearly totals are shown in the uppermost curve of Figure 1. It will be seen that the tree grew very slowly at the beginning and end of its existence and more rapidly in middle age. There are four periods of most rapid growth; the first and most important occurred from about 1780 to 1800, with a maximum from 1786 to 1792, and the second reached its maximum in 1829 to 1830. The third maximum extended from about 1861 to 1878, but is not very striking; on the other hand, the fourth maximum, which comes at 1899 to 1900, is remarkably sharp and definite. It will be noticed that the lengths of the intervals between these maxima, about 40, 40, and 30 years respectively, give an average of 36–37 years, which is very near that assigned to the Brückner cycle.

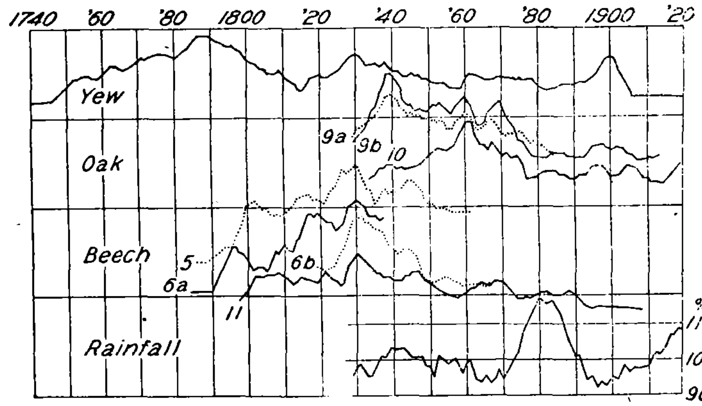

FIG. 1

Measurements of two oak trees are given, both of which grew on Staple Edge Hill and were cut about 1921. The individual measurements are not reproduced here, but the figures smoothed by forming five-yearly totals are shown in Figure 1. Curves 9A and 9B are from measurements taken at right angles on the same tree—an exceptionally well formed root—9A being along a line due west from the center and 9B along a line due north. An attempt had been made at some time to burn the stump, and the outer 40 mm., representing about 42 years' growth, were charred. It will be noticed that from 1830 to 1864 the tree grew somewhat more rapidly on the west than on the north side, but that from 1864 to 1883 this condition was reversed, growth being more rapid on the north side of the trunk. The curve labeled 10 represents the second oak tree, which showed no signs of burning. The two curves 9A and 9B are obviously closely related; No. 10 is fairly similar, but the pronounced maximum just before 1840 is barely represented, and the period of most rapid growth occurred instead about 1860. The most curious point is that these records of oak trees show very little similarity with that of the yew which grew only a short distance away. This is partly due to the much lesser age of the oaks, not one of which was 100 years old, so that the period of slow growth at the beginning of their existence coincides with the full maturity of the yew, and in fact with one of its periods of maximum. It is only when we examine the curves in detail that we can see points of resemblance, in particular the rapid increase of growth rate about 1860 and the general slow growth from 1880 to 1893. There is a distinct suggestion that the oaks responded more rapidly to changes of weather than the yew, for the curves 9 and 10 are far more irregular than the uppermost curve. The pronounced maximum at 1900 on the latter shows itself as a double maximum on both oak trees, and similarly the small minimum of 1865 on the curve for the yew becomes much more important in the oaks.

[2] Fortunately the Astrophysical Observatory of the Smithsonian Institution has already contributed the solar constant values for the dates in question to the Weather Bureau for publication on the Daily Weather Maps. The values are as follows:

Feb. 21	1.939 satisfactory minus.
Mar. 17	1.922 satisfactory minus.
Mar. 18	1.944 satisfactory minus.
Mar. 19	1.956 satisfactory minus.

—*Ed.*